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The flip side of biodiversity: How do new species arise?

004 EPA STAR Graduate Fellowship Conference *Next Generation Scientists—Next Opportunities*

nvironmental Issue

odiversity is the result of two processes

eciation and extinction represent opposing sides of diversity; one is responsible for the creation and the other destruction of biodiversity.
detailed understanding of these processes is the key to servation of biodiversity.

tinction is the eventual fate of every ecies

deniably, current extinction rates are high and increasing at alarming rate (Wilson,1989; Heywood, 1995).
ditionally, conservation biologists have focused on and e made considerable progress in understanding extinction l viability of populations.
wever, this approach ultimately represents a losing battle, extinction is the eventual fate of all species.

peciation can occur rapidly

complementary approach that has received little discussion ased on the creative side of the biodiversity equation.
cently it has become clear that adaptive evolution can occur idly enough to be studied directly in natural populations cent suggestions indicate that early stages of reproductive ation may evolve rapidly; ranging from historical time (Feder 8) to within 13 generations (Hendry 2000).
reover, sexual selection, sexual conflict, and ecological ection have recently been implicated as “engines of ciation”.

Death is one thing, but an end to birth something else” – Michael Soule

Scientific Approach

Phylogenetic inference

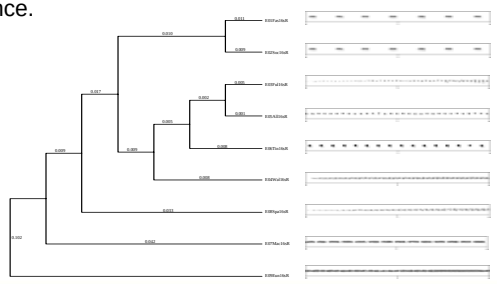
•Prior to questions regarding the process of speciation, one must identify the pattern of speciation.
•I have constructed a robust molecular phylogeny based on both mitochondrial and nuclear genes for the ground cricket genus *Allonemobius*.

Potential reproductive isolating mechanisms

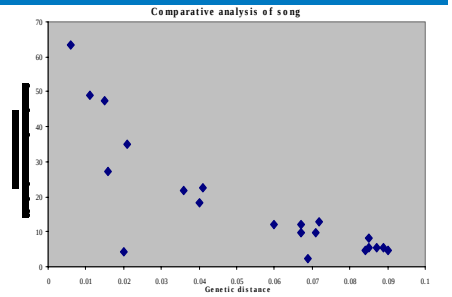
•Male crickets produce species-specific calling songs to which females are attracted. Therefore, sexual selection acting on male calling song may drive speciation.
•These species are broadly sympatric, but each occupies a unique habitat. Therefore, divergent ecological selection on habitat preferences may drive speciation.

Comparative analysis

•By mapping traits associated with reproductive isolation on the phylogeny, inferences can be made regarding the prevalence and rapidity with which reproductive isolation evolves.
•The relationship between phylogenetically weighted trait differences and genetic distance will allow identification of major modes of speciation.
•Traits important for speciation should show a negative relationship between weighted trait divergence and genetic distance.



Results



•Male calling song is more divergent than expected among closely related species.
•This suggests that sexual selection acting on song has driven speciation in these crickets.

Impact

Conserving evolutionary forces

•Evolutionary theory makes strong predictions regarding the importance of various demographic parameters for different modes of selection.
•By understanding the forces driving speciation, we can identify the demographic parameters important for that mode of speciation.

Promoting speciation

•By working together, evolutionary and conservation biologists can determine the forces driving speciation for various taxa, predict the demographic parameters important for that form of selection, and manage populations to promote the production of biodiversity.

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